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ABSTRACT

A project was conducted to develop pedagogical skills necessary for teaching competency-based vocational education (CBVE) among the 17 teachers at the North Fayette Area Vocational-Technical School (Pennsylvania). Activities included validating a list of competencies for each vocational area using local craft committees; developing pedagogical skills necessary to write performance objectives for all competencies on the validated list of competencies; and designing a system for the development of an individualized instructional approach to curriculum-based on-career objectives of secondary students. These activities were carried out on a one-to-one basis between curriculum coordinators and teachers during released time for inservice teacher education. As a result of the project, instructors became more proficient in working with competency-based vocational education; a competency-based approach to curriculum was developed at the school; and craft committees, instructors, and curriculum coordinators developed a closer working relationship and better knowledge of CBVE. (Included in the report are competency-based vocational education materials developed through the project, lesson plans, sample validated task lists, and evaluation instruments.) (Author/KC)

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Final Report

Curriculum Coordinator Project

Contract No. 85-1803

Mr. William F. Barry, Director

North Fayette Area

Vocational-Technical School

Locust Street Extension

Connellsville, Pennsylvania 15425

June 30, 1982

Pennsylvania Department of Education

Bureau of Vocational Education

Research Coordinating Unit

For Vocational Education

CE033771

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Preface and Acknowledgments

Instructional content and delivery are essential components of a viable educational program. However, the success of the student receiving instruction, rests with the ability of the instructor to facilitate learning that is directed toward individual needs and ability. A method to structure course content, deliver effective instruction, direct programs toward the individual, and enhance pedagogical skills of the instructor, is through utilization of competency based teaching and learning techniques. On that premise, the North Fayette Area Vocational Technical School received federal/state support to upgrade its secondary vocational program through the delivery of competency based vocational instruction.

The administrative staff of the North Fayette Area Vocational Technical School would like to express its sincere appreciation to Dr. Frank Rozman of VEIN at Millersville State College, and to Dr. Carroll Curtis, Dr. Clarence Dittenhafer, and Jim Lewis of the Research Coordinating Unit, Pennsylvania Department of Education. Gratitude is also extended to Dr. Jerry Olson, Pennsylvania Director of Vocational Education who visited the school to observe the development of the instructional delivery system.

Most of all however, the school expresses its gratitude and a sincere thank you to the seventeen vocational instructors, and office staff who spent long hours in the writing and coordination of instructional materials.

Finally and without whom this project could not have been successfully completed, we wish to thank Agnes FitzGerald for her dedication and expertise in the world of typing.

ABSTRACT

Curriculum Coordinator Project

No. 85-1803

William F. Barry
North Fayette Area Vocational-Technical School
Locust Street Extension
Connellsville, Pennsylvania 15425

$29,073.00 Federal
0 Non-Federal

7/1/81 to 6/30/82

The purpose of this project was to develop teaching skills necessary to instructional delivery at the North Fayette Area Vocational-Technical School.

Objectives:

Validate a list of competencies for each vocational area utilizing local craft committees.

To develop pedagogical skills necessary to write performance objectives for all competencies on the validated list of competencies.

To design a system for the development of an individualized instructional approach to curriculum based on career objectives of the secondary student.

Outcomes:

Instructors became more proficient in working with CBVE to begin to implement it into their curriculum.

A new competency based approach to curriculum was developed at North Fayette Area Vocational-Technical School.

Craft committee, instructors and curriculum coordinators developed a closer working relationship and better knowledge of CBVE.

Audience:

The products derived from this project are useful to the Pennsylvania Bureau of Vocational Education and to persons involved in the design and delivery of vocational education.

Products:

- Final Report
- Procedural steps to implement CBVE
- Sample of assessment instruments, and CBVE materials

Background of the Study

In ten years of providing vocational education services to secondary students, the North Fayette Area Vocational-Technical School has attempted to remain abreast of modern methods to deliver instruction. Most of the school's seventeen vocational instructors have been permanent faculty members since the school's inception in 1972, and have traditionally structured their programs to meet educational levels of all students. As with all educators, North Fayette Area Vocational-Technical School staff members recognize the need for professional development to enhance the delivery of the best possible instruction. In an effort to develop state of the art teaching methods, North Fayette AVTS felt that by implementing a competency based approach to vocational education could; increase the pedagogical skills of instructors, better structure course content according to local employment needs, and most importantly, better prepare its graduates to enter the work force. On that basis, in Novermber of 1981, the school implemented a structured system by which to transcend traditional teaching methods into a competency based instructional delivery system.

Procedures

To conduct the project activities, a curriculum specialist was employed to coordinate instructional staff activities. During the initial phase of the project and prior to the development of an instructional staff training program, the curriculum specialist found it necessary to spend the first two weeks of the project visiting and observing instructional activities that were in use at the time. This procedure allowed the faculty and curriculum specialist to establish the rapport and understanding that is necessary for effective development of the proposed instructional program. To orient the faculty to the objectives of the project, a faculty meeting was held on November 12, 1981. During the meeting (See Appendix A), the curriculum specialist provided information concerning; the background of vocational curriculum development, the Pennsylvania Bureau of Vocational Education position on CBVE, an overview of CBVE characteristics, and the plan of action to implement CBVE at North Fayette AVTS. Following the group meeting to orient the instructional staff, a schedule was developed to provide each of the seventeen faculty members with one day of release time per month (See Appendix B). During each day of release time, the faculty member and the curriculum specialist worked as a team to structure curriculum materials into a competency based format. To implement that process, a structured sequence of activities was established by which each instructor would progress toward CBVE. These activities, in order of sequence were:

A. Discuss the characteristics and advantages of CBVE. Develop knowledge of V-TECS material for individual program area.

B. Using U.S.O.E. and VEMIS codes, update the vocational program area course description. Identify appropriate occupational titles for each course area based on Dictionary of Occupational Titles and codes.

C. Utilizing the program area advisory committee, conduct a survey to determine projected local employment needs of the community, and determine graduate placement data (See Appendix C).

D. With the aid of V-TECS task lists and other sources, design a preliminary sequence of tasks for each program area. Visit craft advisory members to determine appropriateness of task listing, suggestions for program improvement, and technological development. (See Appendix D)

These procedures culminated in the development of updated course descriptions, a listing of occupational titles, and a sequential listing of competencies or tasks for each of the vocational program areas. Appendix E contains selected samples of these materials which were developed by each vocational instructor.

Instructional Assessment

In order to maintain records of each instructor's progress as he/she moves toward a competency based instructional approach, a special assessment instrument was designed. The instrument is the Developmental Assessment Form for a Compentency Based Instructional System. Basically, the form is a listing of all of the components and steps that should be followed to develop CBVE materials. Each of the developmental procedures is then rated on a five point LIKERT scale ranging from 1 = Non Existent to 5 = Task Completed. At the conclusion of the assessment, the total is calculated for all of the instructional tasks and the score is then converted into a rating summary for each vocational curricula developmental level. A copy of the Developmental Assessment Form appears in Appendix F.

Current Activities

Having progressed through the basic steps that are necessary to implement CBVE, the seventeen vocational instructors are currently developing instructional modules. Each of the modules are based on the task analysis list and are based upon the competency based instructional development process. Using the Lesson Plan Format found in Appendix G, each instructor submits specific information for each module to the curriculum coordinator. The information submitted includes: the course division area, the task to be learned, a performance objective statement, information and/or references, material and/or equipment needed, a performance guide, safety related information, and a criterion reference measure to assess student competencies. Upon the instructor's completion of the lesson plan format, the curriculum coordinator then approves, revises or restructures the information in concert with the vocational instructor. This process then culminates when the material is sent to the typist for final typing and duplication. Although the number of modules developed thus far is not great, examples of final products are provided in Appendix H.

Conclusions and Recommendations

During the first year of the project activities, it appears that all objectives have been met successfully. The first objective was to develop a list of competencies for each vocational area. Attainment of this objective is evidenced by the development of sequential task listings for each vocational program area. The samples presented in the appendix of this report are a result of a concerted effort by the instructor, the curriculum coordinator, and the local craft advisory committee for each program area. Moreover, the design and conduct of projected employment opportunities indicate the development of task listings are based on future employment patterns of specific occupations.

The second objective of this project was to enhance the ability of instructors to employ competency based methods upon which to structure their respective programs. As evidenced by each instructor's schedule of individual meetings with the curriculum coordinator, exposure to craft committee involvement, and the modules developed, it appears that pedagogical ability has increased beyond the entry level abilities of the instructional staff. Although there is a need for continuous revision and maintenance of a staff development program, the instructors appear to be well on the way to using and appreciating the development of CBVE materials.

The final project objective was to design a system of instruction based on individual needs of the secondary student population at North Fayette AVTS. Of the three objectives, this objective seems to lack as much a level of successful attainment as the previous objectives. It should be realized however, that the project is in its first year activities, and a totally prescriptive educational program requires extensive experience, validation, and understanding of CBVE. In retrospect, perhaps this objective should not have been included in the original project proposal and could signify unrealistic expectations caused by the initial enthusiasm of the project's possibilities.

With the completion of the first year project activities, it is recommended that the project be continued. Such action would result in the increased involvement of local craft advisory committees, increased ability of instructors to develop competency based materials, and effective coordination of a planned process upon which to base the curriculum development program. Though these reasons are worthwhile benefits of the program, it should be realized that the invaluable benefit derived from continuation will be the positive impact that the competency based instructional system will have on the vocational attainment level of students at North Fayette Area Vocational-Technical School.

Appendix A

Agenda of Meeting to Orient

Instructional Staff to CBVE

Implementing CBVE at

North Fayette Area Vocational-Technical School

Faculty Meeting November 12, 1981

I. Background of Curriculum Development Projects in Pennsylvania

   A. Penn State - Vincent/Welch Study (June 1978)
   B. Parallel Acceptance of CBVE by Bureau of Voc. Ed.

II. Bureau of Vocational Education Position on CBVE

   A. August, 1978 - CBVE mandated by Section 339.22
   B. Definition of CBVE
   C. Elements of CBVE
   D. Research Coord. Unit in implement CBVE

III. Bureau of Vocational Education committment to CBVE

   A. Implementation (money available)
   B. Evaluation of AVTS to determine degree of involvement
   C. Bureau of Voc. Ed. monitoring criteria

IV. Plan of Action at North Fayette AVTS

   A. Activities of Curriculum Specialist
   B. Faculty Involvement
   C. Faculty Services (typist, release time, substitute, availability of materials)

Handouts:

Bureau of Vocational Education Positive Paper

Bureau of Vocational Education Monitoring (Evaluation) Criteria

Position Paper to Implement CBVE at North Fayette AVTS

Appendix B

Schedule of Faculty Release

Time to Collaborate with

Curriculum Specialist

NORTH FAYETTE AREA VOCATIONAL-TECHNICAL SCHOOL

Curriculum Bulletin #1-A

TO: Faculty

FROM: Dr. John Vincent

SUBJECT: Individual Faculty Meetings

Now that all of you have received the schedules for individual meetings with me, perhaps it would help if you know what I think we might accomplish during those meetings.

First of all I assume that each of you are at various levels of course development for your programs, and have different needs to move into competency based programs. Therefore, there cannot be a planned program of development through which each of you will progress at the same time.

During our first meeting our performance objective will be to determine what characteristics or elements of CBE are currently evident in your program. To do this the criterion reference measure (evaluation standard) will be the CBVE Program Monitoring Form which was given to you at the faculty meeting on November 12, 1981.

Now, don't get jittery_I am not here to evaluate you, but, I am here to help you. The information on the CBVE Program Monitoring Form is what competency based education is all about. I feel that together we can move into CBVE with little difficulty, and in the process become teachers that prepare more competent students.

In other words, based on what activities you think are needed to develop good CBVE material we will work together to reach that objective.

P.S. If you would like to know more about CBVE before our initial meeting, I do have reading material available.

Tentative Schedule

November 16, 1981
Dr. John Vincent

North Fayette Area Vocational-Technical School

Faculty Release Time Schedule
to Develop CBVE Material

Faculty Member	December	January	February	March	April	May
Bradley	16	05	19	15	06	04
Hominsky	03	06	22	16	07	05
Jesick	04	07	23	17	14	06
Kemp	07	08	01	18	15	07
Kiefer	08	11	02	19	16	10
Komarinski	09	12	03	22	19	11
Krasonic	10	13	04	01	20	12
Moore	14	15	08	03	22	14
O'Brien	15	18	09	04	23	17
Powell	02	19	10	05	26	19
Occhuizzo	17	20	11	08	27	20
Prinkey	18	21	12	09	28	21
Swenglish	21	22	16	10	01	24
Thomas	22	25	17	11	02	25
Frye	-	26	18	12	05	June 3

Appendix C

Sample of Employment Projection

Survey to Craft Committee Members

North Fayette Area Vocational-Technical School

Locust Street Extension
Connellsville, Pennsylvania 15425
Phone (412) 626-0236

William F. Barry
Vocational Director

Ronald M. Sheba
Administrative Assistant

As an advisory committee member of the North Fayette Area Vocational-Technical School, your suggestions contribute greatly to the development of our course offerings.

In a continuing effort to structure our courses to meet the needs of local employers, we are conducting an employment projection survey. The purpose of the survey is to help us determine what the occupational needs of the employment community will be in the next three to five years. Also, we would like to know in which specific occupations our graduates are employed. The results of the survey will enable us to prioritize the occupation within each course area to best accommodate the career direction of our students.

With this in mind, I would like to ask that you complete the attached survey instrument.

It should take no longer than 10-15 minutes and a return envelope is provided for your convenience.

I sincerely appreciate your help and the results of this survey will be mailed to you at the completion of the study.

Sincerely,

N. Fayette AVTS

Advisory Committee Employment

Projection Survey for

_____

Directions: For each occupation listed below, place an X in the appropriate column to indicate what you feel the occupational needs of the employment community will be in the next 3-5 years.

OCCUPATIONAL TITLE (Source: Dictionary of Occupational Titles)	1 = There will be no need 2 = There will be a limited need 3 = There will be no change 4 = The need will increase slightly 5 = There will be a great need					Does your company employ any of our graduates in each occupation? If yes, how many?		
	1	2	3	4	5	Yes	No	How Many

List any other occupation that you feel should be included in the _____ program at N. Fayette AVTS.

_____ _____ _____

_____ _____ _____

Comments or Suggestions:

(If additional space is needed, use attached sheet)

Your input is very much appreciated and will enable us to better prepare our students for the world of work. - Thank you.

* Please return as soon as possible in the return envelope *

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Appendix D

Instructor Visitation Form:

for Completion with Craft

Committee Member

North Fayette Area Vocational-Technical School

Locust Street Extension
Connellsville, Pennsylvania 15425
Phone (412) 626-0236

William F. Barry
Vocational Director

Kenneth J. Parker
Administrative Assistant

February 1, 1982

To: Faculty

From: J. Vincent and O. Pletcher

Subject: Craft Committee Meetings

Now that we are well into the process of developing competency based instructional materials, this may be a good time to demonstrate more Craft Committee involvement.

Therefore, during the month of February on the day that you are scheduled to work on curriculum development, you may use that day as a part of the day to visit craft committee members.

To keep track of the visitations you make, one copy of the attached form should be completed for each committee member visited.

Additional forms are available from J. Vincent or O. Pletcher.

After completing your visitation, please return the form to O. Pletcher.

Thank you.

North Fayette Area Vocational-Technical School

Advisory Committee
Visitation Report Form

*This form is to be completed on those occasions when instructors are provided release time to visit craft committee members

Instructor_____ Program Course Area_____

Date (s) _____

1. List Craft committee member visited

Name: _____ Name of Company_____

Address: _____

_____

2. Approximate time spent_____

3. General discussion:

4. Suggestions for program improvement:

5. New technical developments in field (example: new machinery, new process)

_____ _____
Instructor Signature Craft Committee Member Signature

Appendix E

Samples of Vocational Program

Course Descriptions, DOT Listings,

and Task Lists

NORTH FAYETTE AREA
VOCATIONAL TECHNICAL SCHOOL

Locust Street Extension — Connellsville, Pa.

Carpentry

North Fayette Area Vocational–Technical School

COMPETENCY BASED INSTRUCTIONAL SYSTEM

Course Area:	
Course Division:	Task:
Instructor:	

Carpentry

Carpentry is a three-year course designed to prepare students to enter the construction industry as a carpenter apprentice.

This course will permit students to develop skills, knowledge and attitudes needed to succeed in the construction field. Emphasis will be placed on safety, employer-employee relationships, and the relationship of the fellow workman.

The student will learn how to use and care for hand tools and power tools, identify lumber as to type and size, and learn the various uses of wood products. Students will also have the opportunity to become familiar with blue prints, estimating board footage, and the cost of materials.

Carpenters, who comprise the largest group of workers in the building trade, are employed in almost every type of construction activity. The students will be given as much experience in working with tools and lumber as possible under shop conditions, where the maximum time they may obtain in three years will be equivalent to three fourths of a year apprenticeship, or less than one fifth of their total four year apprenticeship to become a journeyman carpenter.

A better knowledge of their trade will enable the students to become better adjusted adults.

D.O.T.
ENTRY LEVEL OCCUPATIONS FOR: Carpentry

U.S.O.E. 17.1001
VEMIS 027

	D O T Code Numbers	D O T Titles
1.	860.381-026	Carpenter Apprentice
2.	869.664-014	Laborer, Carpenter
3.	860.381-042	Carpenter, Rough
4.	660.280-014	Cabinet Maker - Apprentice
5.	866.381-014	Roofer Apprentice
6.	929.687-030	Lumber yard worker
7.	922.687-074	Lumber sorter
8.	922.687-022	Lumber Salvager
9.	922.687-070	Lumber Handler
10.	860.381-042	Scaffold Builder
11.	842.361-010	Wood Lather
12.	869.684-050	Sheetrock Applicator
13.	860.281-010	Carpenter Maintenance
14.	662.682-014	Multiple-Drum Sander
15.	662.682-018	Stroke-Belt-Sander Operator
16.	669.686-030	Wood Working-Machine Feeder
17.	669.686-034	Wood Working-Machine Off Bearer
18.	669.687-010	Cleat Feeder
19.	669.687-018	Lumber Straightener
20.	863.684-014	Sider (Siding Applicator)
21.	869.684-042	Roof Assembler
22.	869.684-038	Panel Installer
23.	866.684-010	Roofer Applicator
24.	866.381-010	Roofer

POSSIBLE OCCUPATIONS WITH ADDITIONAL TRAINING FOR: Carpentry

	D O T Code Numbers	D O T Titles
1.	869.684-034	Layout worker
2.	860.131-010	Supervisor, Acoustical Tile Carpenters
3.	860.131-018	Supervisor, Carpenters
4.	860.137-010	Carpenter, Labor Supervisor
5.	860.261-010	Carpenter, Inspector
6.	860.381-010	Carpenter, Acoustical
7.	860.381-022	Carpenter
8.	860.381-046	Form Builder
9.	860.664-010	Carpenter I
10.	860.681-010	Carpenter II
11.	860.684-010	Builder, Beam
12.	860.684-014	Sider
13.	660.130-010	Cabinet Maker, Supervisor
14.	660.280-010	Cabinet Maker
15.	664.382.014	Wood Turning - Lathe Operator
16.	669.382-014	Rafter-cutting Machine Operator
17.	760.684-010	Bench Carpenter
18.	760.684-014	Box Maker (Wood)
19.	221.482-014	Estimator, Lumber
20.	669.587-010	Inspector, Lumber
21.	182.267-010	Building Construction Inspector
22.	168.267-010	Building Inspector
23.	860.381-022	Building Insulating Carpenter
24.	669.687-014	Dowel Inspector

CARPENTRY

Task List

1. SELECTING AND USING BUILDING MATERIALS

1. Calculate cost of building materials purchased in quantity.
2. Check and receive material orders upon delivery.
3. Determine the cost of lumber, based upon standard grades,
4. Determine the kinds of wood suitable for finish work.
5. Determine the kinds of wood suitable for rough construction.
6. Identify actual sizes of milled lumber in relation to nominal sizes.
7. Identify anchor and bolt type fasteners as to uses.
8. Identify common types of wall boards.
9. Identify common types of wood used in construction.
10. Identify commonly used miscellaneous fasteners such as: toggle bolts, corregated fasteners.
11. Identify defects and blemishes that affect durability and strength of lumber.
12. Identify finish nails by types, sizes and use.
13. Identify grades of finish lumber.
14. Identify grades of framing lumber.
15. Identify grades of residential doors as to standards.
16. Identify gypsum boards as to characteristics and use.
17. Identify hardwoods as to characteristics and use.
18. Identify methods of sawing a log for durability and quality of lumber such as: quarter-sawed.
19. Identify methods of storing and caring for lumber.
20. Identify common nails by types, size and use.
21. Identify pressboards (including plywood) as to characteristics and use.
22. Identify roofing nails by types, size and use.

23. Identify softwoods as to characteristics and use.
24. Identify specifications used to grade lumber.
25. Identify symbols and abbreviations commonly used to classify lumber.
26. Identify types and use of adhesives.
27. Identify types of building insulation materials.
28. Identify types of floor coverings such as (asphalt and ceramic tile).
29. Identify common types of roof shingles.
30. Identify common types of moulding as to uses.
31. Identify types of roofing materials.
32. Identify wood screws by types, sizes and use.
33. Order mixed concrete by specifications.
34. Recognize usable lumber as to moisture content.
35. Select and order material for form construction.
36. Select framing lumber for specific uses.
37. Select cabinet hardware.
38. Select cabinet lumber and materials.
39. Select door and window hardware.
40. Select doors for design and function.
41. Select exterior trim.
42. Select interior door and window trim.
43. Select molding for design and use.

II. USING HAND AND POWER TOOLS

1. Bore holes with drill press.
2. Bore holes with hand brace using augers and expansion bits.
3. Check installations for level and plumb with carpenter's level.
4. Copy and transfer angles using sliding T-level, protractors, combination squares as lay-out tools.

5. Cut chamfers with table saw.
6. Cut compound miters with table saw.
7. Cut dado and grooves with portable router.
8. Cut gains for door hinges with chisel and hammer.
9. Cut holes with keyhole saw.
10. Cut irregular shaped patterns with saber and band saws.
11. Cut irregular shapes with router.
12. Cut large sheets of plywood and wall-board with table saw.
13. Cut miters with table (and other power) saws.
14. Cut miters with the miter box and saw.
15. Cut small trim stock with coping saw.
16. Cut square and angular cuts with miter box and saw.
17. Cut stock to size with hand saw.
18. Cut stock to size with radial arm saw.
19. Cut stock to size with table saw.
20. Demonstrate proper use and safe practices in using hand and power tools.
21. Drill, countersink, counterbore and drum sand on drill press.
22. Drill holes with the portable hand drill.
23. Fasten stock with screws, using standard and ratchet screw drivers.
24. Glue wood stock with hand and bar clamps.
25. Identify job safety requirements and use of protective equipment.
26. Install dowels in common wood joints.
27. Join stock with the jointer.
28. Make butt joints.
29. Make dado joints.
30. Make gain joints.

Task List

31. lap joints.

32. Make miter joints.

33. Make mortis and tenon joints.

34. Make rabbit joints.

35. Make scarf joints.

36. Plane stock to specified sizes with block plane.

37. Plane stock to specified sizes with jack plane.

38. Plane stock to thickness with single surface planer (surfacer).

39. Read and measure with folding rules and squares.

40. Read linear scales.

41. Rip plyboards (such as plywood) with portable saw.

42. Rip plyboards (such as plywood) with table saw.

43. Cut freehand with portable cutter.

44. Sand finish materials by hand.

45. Sand surfaces and edges with belt sander.

46. Sand surfaces and edges with orbital sander.

47. Sand surfaces and edges with oscillating sander.

48. Select proper hammer and drive various type and size nails.

49. Set nails with nail set and punches.

50. Shape edges and cut patterns on the wood shaper.

51. Shape stock using jigs.

52. Sharpen and care for hand saws.

53. Sharpen and care for wood chisels.

54. Sharpen plane irons and care for hand planes.

55. Sharpen power saw blades.

56. Turn stock fastened to face plate with wood lathe.

57. Turn stock into cylindrical shapes with wood lathe.

CARPENTRY

Task List

III.

READING BLUEPRINTS AND PREPARING SPECIFICATIONS

1. Apply for building permits.
2. Design and sketch working drawings for cabinets.
3. Determine dimensions from plans.
4. Estimate concrete requirements from plans and specifications.
5. Follow instructions in exploded view detail drawings.
6. Follow oral instructions given by supervisors as specifications.
7. Identify American Institute of Architects (AIA) building symbols.
8. Identify American Standard plumbing symbols.
9. Identify commonly used abbreviations for building terms.
10. Identify dimensioning methods used on plans.
11. Identify electrical symbols.
12. Identify heating and air conditioning installation symbols.
13. Identify reference points and bench marks.
14. Identify roof framing components on roof framing plans.
15. Ifentify specific building components from sectional views.
16. Identify standard masonry symbols.
17. Identify standard procedures used in arranging information in specifications.
18. Identify standard structural steel symbols used in construction.
19. Identify structural components on floor framing plans.
20. Identify the importance and need for specifications.
21. Identify types of building materials specified in plans.
22. Identify types of commercial building construction.
23. Identify types of door openings and locations on plans in relation to door schedules.
24. Identify standard views and typical details used on blueprints.
25. Interpret and work from multiview drawings.

26. Interpret architectural specifications.
27. Interpret building codes.
28. Itemize material orders from plans and specifications.
29. Lay out angles from plans and specifications.
30. Lay out arches from plans and specifications.
31. Lay out building components from detail drawings.
32. Lay out construction based upon modular standards.
33. Lay out construction details from blueprints and specifications.
34. Lay out patterns of irregular shaped objects from blueprint.
35. Locate center lines for layout.
36. Locate special installation on detail drawings.
37. Locate window and door openings in relation to schedules on plans.
38. Make minor revisions in plans as specified by builder.
39. Measure with architect's scale.
40. Measure with engineer's scale.
41. Scale drawings for dimensions omitted on blueprints.
42. Sketch and draw rough detail (working) drawings.
43. Sketch and draw rough pictorial drawings.
44. Verify specifications and requirements of local building codes.

IV. PREPARING BUILDING SITE

1. Establish elevation reference points (bench marks) with builder's level or transit.
2. Establish footing grades with builder's level or transit.
3. Establish plot boundary lines.
4. Install drainage system for basements.
5. Install drainage systems for footings and foundations.

6. Install dry wells to local (codes) specifications.
7. Install discharge water lines to local (codes) specifications.
8. Lay out a single-level building.
9. Lay out a split-level building
10. Lay out building site with transit.
11. Locate and square corners using builder's transit.
12. Locate supply water lines.
13. Locate and square corners using triangluation method.
14. Locate and mark excavation lines.
15. Locate building site in relation to property lines.
16. Locate piers and columns.
17. Locate property lines.
18. Prepare site for slab-on-ground construction.
19. Set and level batter boards for rough excavation.
20. Set grade stakes.

V. BUILDING AND INSTALLING FOUNDATION FORMS

1. Calculate concrete for footings and foundation walls.
2. Calculate the quantity of concrete blocks for block walls.
3. Construct double wall panel foundation forms.
4. Construct frames for special openings in foundation walls.
5. Aligh form walls.
6. Brace foundation wall forms.
7. Install whalers and form ties.
8. Construct concrete step and stair forms.
9. Construct column and pier forms.
10. Construct single wall foundation forms.

11. Construct square type footing forms.
12. Construct "T" type footing form.
13. Install anchor bolts in concrete block walls.
14. Install battered forms.
15. Install beam and slab forms.
16. Install bulkheads.
17. Install door and window opening bucks.
18. Install exterior wall (drop head) pilaster.
19. Install expansion and contraction joints in concrete.
20. Install key-ways for footing and foundations.
21. Install intersecting wall ties.
22. Install vapor barriers.
23. Install water seal at footing elevation.
24. Locate center lines for columns and templates.
25. Set batter boards for installing foootings and foundations.
26. Set screeds for concrete floors and walkway.
27. Treat forms with chemical coatings for waterproofing and stripping.
28. WWaterproof concrete block walls.

VI.
CUTTING AND INSTALLING ROUGH FRAMING

1. Align framing members such as: studs, joist, rafters, plates, and sills.
2. Apply sub-bases over sub-floors.
3. Build and erect single-pole scaffolds.
4. Build box beams.
5. Build laminated wood arches and beams.
6. Build laminated wood trusses.

7. Build mason's scaffolds.
8. Build multiple corner posts.
9. Build saw horses.
10. Check foundation for squareness.
11. Frame a built-up stair stringer (or horse).
12. Frame a cleated type stair stringer (or horse).
13. Frame a plumbing partition for soil and vent pipes.
14. Frame arch's for masonry walls.
15. Frame and align balloon (frame) walls.
16. Frame and align exterior walls.
17. Frame and align partition walls.
18. Frame and install a built-up "T" still.
19. Frame and install box sills.
20. Frame and install "L" sills.
21. Frame built-up wood beams.
22. Frame built-up wood girders.
23. Frame floor joists for tile floor.
24. Frame joists for exterior door sills.
25. Frame joists into steel beams or girders.
26. Frame openings for joist hangers.
27. Frame openings with tail joists, and doublers or trimmers.
28. Frame semi-circular arched openings.
29. Frame special openings for meter and service boxes.
30. Frame window and door opening with trussed headers.
31. Furr masonry walls for lathe.
32. Identify federal housing authority (FHA) specifications applicable to rough framing.

33. Identify framing members.
34. Install and align a balloon wall frame assembly.
35. Install and align conventional wall frames.
36. Install attic runways or catwalks.
37. Install backing for hanging fixtures and cabinets.
38. Install bridging for joists.
39. Install ceiling joists (western and balloon frame).
40. Install diagonal bracing.
41. Install double top wall plates.
42. Install firestops and firewalls.
43. Install floor joists.
44. Install mudsills or plates to foundation.
45. Install plaster or trim grounds.
46. Install plates for platform framing.
47. Install post and beam framing.
48. Install steel beams.
49. Install structural sheathing.
50. Install trimmer studs in accordance with building codes.
51. Lay out a framing story pole.
52. Lay out segments for elliptical arches using the trammel bar method.
53. Lay out sills for balloon frame construction.
54. Lay out simple stair stringers (or horse).
55. Lay out stair well openings.
56. Lay sub-floors.
57. Lay tile (or linoleum) on sub-base over regular sub-floors.
58. Set and align girders.

CARPENTRY

Task List

VII.

LAYING OUT, CUTTING AND INSTALLING ROOF COMPONENTS

1. Calculate the rise and run of a common roof.
2. Determine the length of rafters from the fafter scale.
3. Identify structural members of conventional roofs.
4. Identify terms used in roof framing.
5. Identify the major factors to be considered in planning a roof.
6. Identify types of roof construction.
7. Lay out ceiling josts for rafter installation.
8. Lay out common rafters for equal-pitch roofs.
9. Lay out common rafters for unequal-pitch roofs.
10. Install common rafters for equal-pitch roofs.
11. Install common rafters for unequal-pitch roofs.
12. Install cripple jack rafters for hip and valley installation.
13. Install gable studding.
14. Install hip rafters for equal-pitch roofs.
15. Install hip rafters for unequal-pitch roofs.
16. Install gambrel roof rafters.
17. Install roof sheathing of various types such as: plywood, T & G.
18. Apply under shingle insulation.
19. Build rafter trusses.
20. Flash chimney and roof vents.
21. Flash chimney and roof vents.
22. Flash valleys.
23. Frame dormers.
24. Frame for a roof saddle.
25. Frame plank-and-beam roof.

26. Frame roof openings for dormers, chimneys and ventilators.
27. Frame snub (false) gables.
28. Install and align ridge boards.
29. Install asphalt and composition shingles.
30. Install built-up roofs.
31. Install collar ties.
32. Install hip and ridge shingles.
33. Install purlins.
34. Install roof louvers.
35. Install tail rafters for open cornices.
36. Install valley rafters for equal-pitch roofs.
37. Install valley rafters for unequal-pitch roofs.
38. Install valley shingles.
39. Install wood shingles.
40. Lay out cripple jack rafters for hip and valley installation.
41. Lay out for bonding shingles over dormers (or other roof appendages).
42. Lay out gable studs.
43. Lay out gambrel roof rafters.
44. Lay out gambrel roofs.
45. Lay out hip rafters for equal-pitch roofs.
46. Lay out hip rafters for unequal-pitch roofs.
47. Lay out intersecting gable roofs.
48. Lay out jack rafters for hip and valleys.
49. Lay out mansard roof rafters.
50. Lay out octagon hip and valley rafters.
51. Lay out octagon jack rafters.

52. Lay out purlins.

53. Lay out snub gable roofs.

54. Lay out tail rafters for open cornices.

55. Lay out valley rafters for equal-pitch roofs.

56. Lay out valley rafters for unequal-pitch roofs.

57. Lay out wall plates and ridge-boards to receive rafters.

VIII.
CUTTING AND INSTALLING EXTERIOR FINISH

1. Apply composition shingle siding.

2. Build a porch cornice.

3. Build a projected box cornice (brick construction).

4. Build box or closed cornices.

5. Build entrance canopies.

6. Build open cornices.

7. Calculate costs of siding for walls.

8. Case exterior openings for different types of construction.

9. Construct built-in gutters.

10. Construct casement window frames.

11. Construct double hung window frames.

12. Construct exterior door frames (brick and brick veneer construction).

13. Cut and install metal corners for wall siding.

14. Glaze windows.

15. Identify common components used in cornice construction.

16. Identify kinds of cornice construction.

17. Identify types of windows and window frames.

18. Install brick molding for masonry construction (brick veneer).

19. Install building paper and insulation board.

20. Install casement window frames.
21. Install composition wall sheathing.
22. Install corner boards for various types of wood siding.
23. Install double-course wall shingles.
24. Install double-hung window frames.
25. Install drip caps for window and door frames.
26. Install exterior door frames(brick veneer construction).
27. Install exterior door frames (concrete and block construction).
28. Install gable trim.
29. Install louvres.
30. Install finished columns and beams.
31. Install metal corners for wall siding.
32. Install outside door trim.
33. Install outside porch trim.
34. Install overhead (garage) doors.
35. Install pre-fabricated metal siding.
36. Install pre-fabricated window frames.
37. Install siding on gable wall.
38. Install single course wall shingles.
39. Install storm doors and windows.
40. Install watertable and corner boards for wood siding.
41. Install weather stripping.
42. Install window frames (brick and brick veneer construction).
43. Install wood type bevel and lap siding.

IX. CUTTING AND INSTALLING INTERIOR FINISH

1. Apply finishes.
2. Apply pre-finished hard board to plastered walls.
3. Apply stains.
4. Assemble cabinet face frame.
5. Assemble partitions for cabinets.
6. Bend wood to form or fixed shapes.
7. Build broom or storage closets to specifications.
8. Build cupboard and cabinet doors.
9. Build cupboard and cabinet drawers.
10. Build interior door jambs.
11. Build linen closets to specifications.
12. Cut and install baseboards.
13. Cut and install ceiling molding and trim.
14. Cut and install window trim for double and multiple units.
15. Finish sand interior components such as: doors, trim, cabinet doors, baseboards, moldings and floors.
16. Fit interior doors.
17. Identify door hardware as to types and functions.
18. Identify types and sizes (modules) of interior doors.
19. Identify types of ceiling moldings and trim.
20. Identify types of pre-fabricated wall boards.
21. Identify types of kitchen cabinets.
22. Identify window hardware as to types and functions.
23. Install base shoe or quarter round.
24. Install casement sash in window frames.

CARPENTRY

Task List

25. Install closet shelves and rods.
26. Install corner beads.
27. Install cupboard and cabinet doors.
28. Install cupboard and cabinet door hardware.
29. Install dry-wall boards.
30. Install entrance door lock sets.
31. Install gypsum board lath.
32. Install interior door locks.
33. Install interior folding doors.
34. Install (hang) interior passage doors.
35. Install interior sliding doors.
36. Install interior window trim (frame and brick construction).
37. Install metal corners for dry wall.
38. Install metal lath.
39. Install plaster grounds.
40. Install window hardware.
41. Lay composition (block) flooring on concrete slab.
42. Lay single layer T & G flooring.
43. Lay T & G flooring over sub-floors.
44. Lay out framework for kitchen cabinets.
45. Make face frames for cabinets.
46. Rough in framing for cabinet sinks.
47. Set interior door jambs.
48. Trim interior door openings.

X.

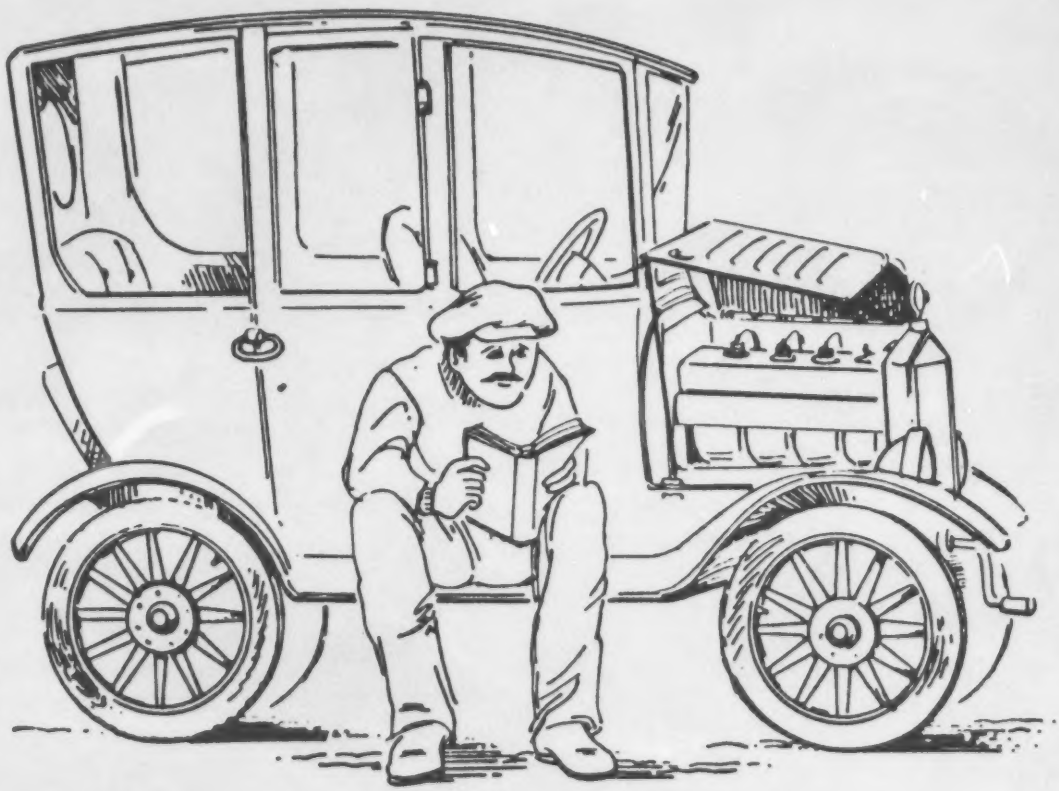
LAYING OUT, CUTTING, AND ASSEMBLING STAIR COMPONENTS

1. Calculate riser height in relation to headroom.
2. Calculate tread width in relation to stair runs.
3. Construct a bullnose or swelled-step riser.
4. Construct porch landings for exterior stairs.
5. Construct open riser stairs.
6. Construct rough frames for stairs.
7. Cut, fit and install balusters and handrails.
8. Determine method of joining risers and treads to compensate for shrinkage.
9. Fit newel posts in open stairs.
10. Frame a straight run stair well.
11. Identify conventional stair layout in relation to use.
12. Identify the primary parts used in stair construction.
13. Install stair skirt.
14. Lay out a straight run stringer using a carpenters square.
15. Lay out a straight two-flight stair, with one landing (platform stair).
16. Lay out a housed stringer.
17. Lay out a stair story pole.
18. Lay out newel posts at turns in stairs.
19. Lay out open-newel stairs.
20. Lay out stair brackets, or panels, on open stringers.
21. Lay out winders for "L" type stair construction.

NORTH FAYETTE AREA VOCATIONAL TECHNICAL SCHOOL

Locust Street Extension

Connellsville, Pa.



AUTOMOTIVE MECHANICS AND AUTOMOTIVE FEEDER

- 32 -

Automotive Mechanics

The Automotive Mechanics course is a three-year course designed to provide the student with practical instruction in the diagnosis, repair, and adjustments of all phases of automotive mechanics. The instruction covers the complete range of work on gasoline engines, clutches, transmissions, differentials, front axle, and wheel suspension front-end alignment, steering mechanisms, brakes, carburetion, fuel and electrical systems. Special emphasis is given to trouble shooting, motor tune-up, and complete overhaul of engines by replacing rings, bearings, valves, gaskets, and other worn parts. After attaining sufficient skill, the student will be given the opportunity to repair automobiles in the laboratory area.

Also, the student will be provided with related theory instruction and develop the ability to use automotive service and parts manuals.

COURSE DESCRIPTION - Automotive Feeder

The Auto Feeder course is the first year of the three year Automotive Mechanics Course. It is designed to provide the student with training in the use of automotive tools and equipment needed for use in the final two years of the course. Included is Basic Theory and Practical Instruction in the following areas: Orientation and Shop Practices, Engines, Cooling Systems, Fuel Systems, Brake Systems, Power Train, Electrical Systems, and Steering and Suspension Systems. Supplementary features of the Auto Feeder Course include Body Mechanics, Estimating of Crash Damage, Theory of Body Repair, and Small Engine Repair.

D.O.T.

U.S.O.E. 17.0302

ENTRY LEVEL OCCUPATIONS FOR: Auto Mechanics

VEMIS 009

	D O T Code Numbers	D O T Titles
1.	620-261-010	Auto Mechanic
2.	620-261-012	Auto Mechanic Apprentice
3.	620-261-014	Automotive Tester
4.	620-281-026	Brake Repairer
5.	620-281-034	Carburetor Mechanic
6.	620-281-038	Front End Mechanic
7.	620-281-062	Transmission Mechanic
8.	620-281-066	Tune-Up Mechanic
9.	620-682-010	Brake Drum Lathe Operator
10.	620-684-010	Automobile Wrecker
11.	620-684-014	Automotive-Mechanic Helper
12.	620-684-018	Brake Adjuster
13.	915-467-010	Auto Service Station Attendant
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15.		
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20.		

D.O.T.

U.S.O.E. 17.03
VEMIS 009

POSSIBLE OCCUPATIONS WITH ADDITIONAL TRAINING FOR: Auto Mechanics

	D O T Code Numbers	D O T Titles
1.	620-261-018	Automotive Repair Service Estimator
2.	620-261-022	Construction Equipment Mechanic
3.	620-281-010	Air Condition Mechanic
4.	620-281-014	Auto Technician, Exhaust Emission
5.	620-281-030	Bus Inspector
6.	620-281-046	Maintenance Mechanic
7.	620-281-050	Mechanic, Industrial Truck
8.	620-281-054	Motorcycle Repairer
9.	620-281-058	Tractor Mechanic
10.	620-281-070	Vehicle-Fuel Stytems Converter
11.	620-381-010	Automotive Radiator Mechanic
12.	620-381-018	Mechanical Unit Repairer
13.	620-381-022	Repairer, Heavy
14.	620-384-010	Motorcycle Tester
15.	620-584-010	Spring Repairer Helper
16.	620-664-010	Construction Equipment Mechanic
17.	620-664-010	Maintenance Mechanic Helper
18.	620-684-022	Clutch Rebuilder
19.	620-684-030	Tractor-Mechanic Helper
20.	600-280-030	Machinist Apprentice, Automotive
21.		

I ORIENTATION

Auto Mechanics - Duty/Task List

(* = denotes on-going activity)

1. Identify unsafe shop conditions *
2. Demonstrate safe shop practices *
3. Demonstrate knowledge of school rules *
4. Demonstrate proper use of instruction sheets *
5. Demonstrate character and personality traits of a mechanic *
6. Display proper personal appearance *
7. Demonstrate proper attitude *
8. Demonstrate proper use of service manuals *
9. Demonstrate proper use of flat rate manuals *
10. Identify safety equipment *
11. Demonstrate proper use of safety equipment *
12. Demonstrate knowledge of fire safety *
13. Identify and use box end wrench
14. Identify and use open end wrench
15. Identify and use combination wrench
16. Identify and use socket wrenches
17. Identify, use, and maintain screwdrivers
18. Identify and use gripping tools
19. Identify and use hammers
20. Identify, use, and maintain punches
21. Identify, use, and maintain chisels
22. Identify and use files
23. Demonstrate use of a parts manual *
24. Identify and use steel rule (scale)

25. Identify and use outside micrometers
26. Identify and use inside micrometers
27. Identify and use dial indicators
28. Identify and use torque wrench (beam-type)
29. Identify and use torque wrench (click-type)
30. Identify and use feeler gauges
31. Identify and use wire gauges
32. Identify and use vernier caliper
33. Identify and use compression guage
34. Identify and use volt meter
35. Identify and use OHM meter
36. Identify and use tachometer
37. Identify and use dwell meter
38. Identify and use battery hydrometer
39. Identify and use antifreeze hydrometer
40. Identify and use timing lights
41. Identify and use soldering gun
42. Identify and use soldering torch
43. Identify and use tubing cutter
44. Identify and use flairing tool
45. Identify and use hack saw
46. Identify and use hand drill
47. Identify and use drill press
48. Identify and use hydraulic press
49. Demonstrate proper lifting technique *

50. Identify and use bench vise
51. Identify and use electric grinder
52. Identify and use vacuum guage
53. Identify and use taps and dies
54. Repairing stripped threads using "Heli-Coil"
55. Identify and use allen wrenches
56. Identify fasteners
57. Estimate vehicle repairs cost
58. Strip, splice and solder wires
59. Supervise shop operations
60. Record shop operations *
61. Maintain a clean shop *

II. ENGINES

1. Develop vocabulary of automotive engines
2. Explain the basic function of an internal combustion engine
3. Demonstrate knowledge of engine performance measurements
4. Identify engine parts
5. Operate ridge reaming tool
6. Lap valves
7. Inspect wear points in a valve train
8. Measure cylinder taper and out of round
9. De-glaza cylinders
10. Measure and install piston rings
11. Disassemble and inspect hydraulic lifters

12. Measure main bearing clearance using plastigage
13. Measure connecting rod clearance using plastigage
14. Making and installing gaskets
15. Cleaning piston ring grooves using ring groove cleaner
16. Adjust valves
17. Clean engines
18. Clean engine parts and check for condition
19. Diagnose valve train and head malfunctions
20. Disassemble engines
21. Grind valves
22. Inspect and correct bearing fit
23. Inspect head for warp
24. Inspect or replace exhaust manifolds
25. Inspect crankshaft and connecting rod assembly using micrometers and other equipment
26. Machine valve guides for special seals
27. Perform compression test
28. Replace connecting rods and bearings
29. Replace crankshaft and bearings
30. Replace engine mounts
31. Replace flywheel
32. Replace gaskets and seals
33. Replace oil pumps
34. Replace oil pan and valve covers
35. Replace pistons

36. Replace rings on pistons
37. Replace timing gears and chains
38. Replace valves
39. Replace valve seals
40. Replace valve lifters
41. Replace camshaft
42. Resurface valve seats
43. Service rocker arm assembly
44. Service oil pumps

III. COOLING

1. Develop vocabulary of automotive cooling systems
2. Demonstrate knowledge of cooling system operation
3. Demonstrate knowledge of cooling system diagnosis charts
4. Demonstrate knowledge of heating systems
5. Check coolant freezing point
6. Check coolant temperature
7. Inspect, adjust or replace fan belts
8. Inspect and repair blowers on air-cooled engines
9. Inspect water hoses
10. Pressure test cooling system for leaks
11. Remove and reinstall radiators
12. Replace heater hoses
13. Replace radiator hoses

14. Replace water pump
15. Solder minor leaks in radiator
16. Test and replace coolant pressure caps
17. Test and replace thermostat

IV.
FUEL SYSTEMS

1. Develop vocabulary of auto fuel systems
2. Identify carburetor systems
3. Demonstrate knowledge of auto fuel systems
4. Demonstrate knowledge of emission control systems
5. Remove and replace fuel pumps
6. Repair fuel lines and hoses
7. Repair or service carburetors
8. Replace fuel lines and hoses
9. Service fuel pumps
10. Service or repair manifold heat controls
11. Service or replace units in vacuum systems
12. Adjust carburetor
13. Clean carburetor
14. Clean or replace fuel filter unit
15. Inspect, clean and adjust choke unit (automatic)
16. Inspect, service, or replace carburetor air cleaner
17. Install carburetors
18. Measure fuel flow and pressure

V.
BRAKES

1. Develop vocabulary of automotive brake systems
2. Develop knowledge of brake systems theory
3. Adjust brakes
4. Adjust hand brake linkage
5. Bleed brakes
6. Free up parking brake cables
7. Inspect and replace brake pads (disc brakes)
8. Inspect and replace self adjusters
9. Perform operational brake inspections
10. Repair disc brake calipers
11. Repair master cylinder
12. Repair hydraulic lines and fittings
13. Repair self adjusters
14. Repair wheel cylinder
15. Replace brake hoses and lines
16. Replace brake shoes
17. Replace hydraulic lines and fittings
18. Replace master cylinder
19. Replace wheel cylinder
20. Replace hand brake linkage

VI.
CLUTCHES

1. Develop vocabulary of automotive clutches
2. Identify parts of a manual clutch
3. Disassemble and inspect clutch components
4. Adjust clutch freeplay

VII.
TRANSMISSION

1. Develop vocabulary of automotive transmission
2. Identify standard transmission
3. Identify automatic transmission
4. Disassemble and inspect standard transmission
5. Demonstrate knowledge of power flow in a standard transmission
6. Identify the major parts of a standard transmission

VIII.
DIFFERENTIALS

1. Develop vocabulary of drive line components
2. Identify the parts of a standard differential
3. Disassemble a standard differential
4. Measure back lash
5. Measure axle end play
6. Measure gear tooth pattern using red lead
7. Demonstrate knowledge of operation of standard differential

IX.
ELECTRICAL SYSTEMS

1. Develop a vocabulary of electrical and ignition systems
2. Demonstrate an understanding of OHM's law
3. Demonstrate knowledge of starting systems
4. Wire a starting system
5. Overhaul and bench test starters
6. Diagnose starter systems
7. Demonstrate knowledge of charging systems

8. Overhaul and bench test alternators
9. overhaul and bench test generators
10. Test batteries
11. Clean batteries and cables
12. Demonstrate knowledge of ignition systems
13. Overhaul distributors
14. Clean, file, test and gap spark plugs
15. Replace and adjust points
16. Set ignition timing
17. Identify electrical system components
18. Wire a lighting system
19. Identify and use solderless terminals
20. Test relays, switches, diodes and other electrical components
21. Identify and repair short and open circuits
22. Measure resistance and voltage drop in circuits

X.
STEERING AND SUSPENSION

1. Develop vocabulary of automotive steering and suspension systems
2. Identify steering and suspension components
3. Inspect, repack and adjust wheel bearings
4. Identify caster
5. Identify camber
6. Identify toe-in
7. Identify toe-out or turns
8. Identify steering axis inclination
9. Lubricate steering components
10. Rebuild power steering pumps
11. Identify tire problems

Welding

Welding is a three-year program designed to provide the student with specialized classroom and shop experiences concerned with setting up and operating metal welding, shielded and non-shielded metal arc, brazing, flame cutting and plastic welding for both hand operated, semi-automatic and automatic equipment.

Specific instruction relates to safety and safety equipment, properties, types and use of electrodes and welding rods, emphasis on the properties of metals, blueprint reading, electrical principles, welding symbols, and mechanical drawings, use of equipment for testing welds by ultrasonic, destruction and hardness testing, use of manuals and specification charts, portable grinder and chemical bath for surface cleaning, positioning and clamping, and understanding of welding standards established by the American Welding Society, American Society of Mechanical Engineers and American Bureau of Ships.

D.O.T.

ENTRY LEVEL OCCUPATIONS FOR: Welding

U.S.O.E. 17.2306

VEMIS 075

	D O T Code Numbers	D O T Titles
1.	816.364-010	Arc Cutter
2.	819.684-010	Brazer, Production Line
3.	813.684-010	Brazer, Repair & Salvage
4.	816 464-010	Burner, Hand
5.	816.364-010	Burn-Out-Scarfing Operator
6.	816.482-010	Radiagraph Operator
7.	816.684-010	Scrap Burner
8.	810.384-014	Weldor, Arc
9	819.384-010	Weldor, Combination
10.	819.361-010	Weldor, Fitter
11.	810.384-014	Weldor, Flux-Cored Arc
12.	810.384-014	Weldor, Gas Metal Arc
13.	810.384-014	Weldor, Gas Tungsten Arc
14.	810.384-014	Weldor, Hand, Submerged Arc
15.	819.687-014	Weldor, Helper
16.	811.684-014	Weldor, Oxyacetylene
17.	819.684-010	Weldor, Combination,Production Line
18.	819.384-010	Weldor, Repair
19.	819.361-010	Weldor, Structural Repair
20.	810.684-010	Weldor, Tack
21.	812.682-010	Welding-Machine Operator, Resistance

D.O.T.

POSSIBLE OCCUPATIONS WITH ADDITIONAL TRAINING FOR: Welding

	D O T Code Numbers	D O T Titles
1.	819.281-018	Performance Test Inspector
2.	819.281-022	Weldor, Experimental
3.	819.131-014	Welding Supervisor
4.	819.281-018	Welding Tester
5.	819.281-018	Weld Inspector
6.	810.384-014	Welder, Boilermaker
7.	011.261-014	Welding Technician
8.	011.061-026	Welding Engineer
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WELDING
TASK LIST

I. OPERATING GAS WELDING EQUIPMENT

1. ASSEMBLE OR DISASSEMBLE OXY-ACETYLENE OR MAPP GAS PORTABLE EQUIPMENT
2. ASSEMBLE OR DISASSEMBLE OXY-ACETYLENE STATIONARY EQUIPMENT
3. ASSEMBLE OR DISASSEMBLE OXY-HELIUM EQUIPMENT
4. ASSEMBLE OR DISASSEMBLE OXY-HYDROGEN EQUIPMENT
5. BRAZE FERROUS METALS WITH GAS EQUIPMENT
6. BRAZE NONFERROUS METALS WITH GAS EQUIPMENT
7. CHANGE OXYGEN ACETYLENE OR MAPP GAS BOTTLES
8. CLEAN OXY-ACETYLENE EQUIPMENT
9. CLEAN WELDING TIPS ON GAS EQUIPMENT
10. CUT LOW MEDIUM OR HIGH CARBON STEEL WITH GAS EQUIPMENT
11. FORGE METALS WITH GAS EQUIPMENT
12. GAS WELD CAST IRON
13. GAS WELD COPPER OR COPPER ALLOYS
14. GAS WELD LOW AND MEDIUM CARBON STEELS
15. HARD FACE COPPER AND COPPER ALLOYS WITH GAS EQUIPMENT
16. HARD FACE HASTELLOY METALS WITH GAS EQUIPMENT
17. HARD FACE LOW MEDIUM OR HIGH CARBON STEELS WITH GAS EQUIPMENT
18. HARD FACE MAGNESIUM OR MAGNESIUM ALLOYS WITH GAS EQUIPMENT
19. LEAD SOLDER FERROUS METALS WITH GAS EQUIPMENT
20. LEAD SOLDER NONFERROUS METALS WITH GAS EQUIPMENT
21. PERFORM SCAP AND WATER LEAK TEST ON GAS WELDING EQUIPMENT
22. SHAPE METALS WITH GAS WELDING EQUIPMENT
23. SILVER SOLDER FERROUS METALS WITH GAS EQUIPMENT
24. SILVER SOLDER NONFERROUS METALS WITH GAS EQUIPMENT
25. REMOVE DISTORTION USING GAS WELDING EQUIPMENT

II. OPERATING METALLIC ARC WELDING EQUIPMENT

1. DETERMINE PROCESSING REQUIREMENTS FROM DRAWINGS OR SPECIFICATIONS
2. SET UP FOR METAL CUTTING
3. SET UP FOR WELDING IN THE FLAT POSITION
4. ARC-WELD LOW MEDIUM OR HIGH CARBON STEELS
5. SET UP FOR WELDING IN THE HORIZONTAL POSITION
6. SET UP FOR WELDING LAP JOINTS
7. SET UP FOR WELDING CORNER OR EDGE JOINTS
8. SET UP FOR WELDING IN THE VERTICAL POSITION
9. SET UP FOR WELDING IN THE OVERHEAD POSITION
10. SET UP FOR WELDING BUTT JOINTS
11. CUT LOW MEDIUM OR HIGH CARBON STEELS WITH ARC-WELDING EQUIPMENT
12. CUT CAST IRON WITH ARC-WELDING EQUIPMENT
13. CUT ALUMINUM OR ALUMINUM ALLOYS WITH ARC-WELDING EQUIPMENT
14. ARC-WELD HEAT AND CORROSION RESISTANT STEELS
15. ARC-WELD CAST IRON
16. ARC-WELD ALUMINUM OR ALUMINUM ALLOYS
17. SET UP FOR WELDING OR BRAZING PIPE JOINTS
18. SET UP FOR MAKING A PLUG WELD
19. HARD SURFACE LOW MEDIUM OR HIGH CARBON STEEL WITH ARC-WELDING EQUIPMENT

WELDING
TASK LIST

III. OPERATING METALLIC INERT GAS GMAW AND TUNGSTEN INERT GAS GTAW SHIELDED WELDING

1. OPERATE CARBON-DIOXIDE SHIELDED EQUIPMENT
2. ADJUST WATERFLOW GAS FEED AND AMPERAGE WHEN WELDING WITH METALLIC INERT GAS
3. WELD ALUMINUM OR ALUMINUM ALLOYS WITH MIG EQUIPMENT
4. WELD HEAT AND CORROSION RESISTANT STEELS WITH MIG EQUIPMENT
5. WELD LOW MEDIUM OR HIGH CARBON STEELS WITH MIG EQUIPMENT
6. OPERATE ARGON GAS SHIELDED EQUIPMENT
7. ADJUST WATERFLOW GAS FEED AND AMPERAGE WHEN WELDING WITH TUNGSTEN INERT GAS
8. WELD ALUMINUM OR ALUMINUM ALLOYS WITH TIG EQUIPMENT
9. WELD CHROMOLY METALS WITH TIG EQUIPMENT
10. WELD COPPER OR COPPER ALLOYS WITH TIG EQUIPMENT
11. WELD HEAT AND CORROSION RESISTANT STEELS WITH TIG EQUIPMENT
12. WELD LOW MEDIUM OR HIGH CARBON STEELS WITH TIG EQUIPMENT
13. WELD MAGNESIUM OR MAGNESIUM ALLOYS WITH TIG EQUIPMENT
14. REMOVE OR REPLACE MIG WELDING EQUIPMENT COMPONENTS OR ACCESSORIES
15. REMOVE OR REPLACE TIG WELDING EQUIPMENT COMPONENTS OR ACCESSORIES

IV. CLEAN TEST AND CLASSIFY METALS

1. MECHANICALLY CLEAN METALS
2. BEND TEST METALS
3. TEST METALS USING GUIDED BEND TESTER
4. IDENTIFY METALS USING METAL IDENTIFICATION KIT
5. IDENTIFY STEELS USING THE AMERICAN IRON AND STEEL INSTITUTE CODING SYSTEM
6. VISUALLY EXAMINE METALS FOR IDENTIFICATION
7. INSPECT WELDS USING ZYGLOW AND/OR DYE PENETRANT METHODS

V. OPERATING AUXILIARY EQUIPMENT AND TOOLS

1. CHIP METAL USING HAND CHIPPING EQUIPMENT
2. CUT MATERIALS WITH HAND HACKSAWS
3. DRILL METAL USING POWER EQUIPMENT
4. GRIND METAL USING POWER EQUIPMENT
5. PUNCH METAL USING POWER EQUIPMENT
6. CUT METAL WITH POWER CUTTING EQUIPMENT
7. ROUGH AND FINISH METAL SURFACES WITH HAND TOOLS
8. BEVEL PIPE USING PIPE BEVELING MACHINE
9. CUT METAL SHAPES USING UNIVERSAL IRON WORKING MACHINE
10. BEND PIPE USING HYDRAULIC PIPE BENDER

WELDING

TASK LIST

VI. SUPERVISION TRAINING AND JOB ESTIMATING

1. ASSIGN PERSONNEL TO DUTY POSITIONS
2. DETERMINE WORK PRIORITIES IN THE TRADE
3. PREPARE SHOP BUDGETS AND FINANCIAL REQUIREMENTS FOR JOBS
4. ESTABLISH PERFORMANCE STANDARDS FOR JOBS
5. PLAN AND SCHEDULE WORK ASSIGNMENTS
6. CONDUCT SAFETY PROGRAMS
7. ESTIMATE COST OF NEW FABRICATION
8. ESTIMATE COST OF REPAIRS
9. INVESTIGATE ACCIDENTS OR INCIDENTS
10. CONDUCT ON-THE-JOB TRAINING (OJT)
11. INTERVIEW PROSPECTIVE EMPLOYEES
12. CONDUCT WELDING TESTS FOR PROSPECTIVE EMPLOYEES
13. INVENTORY EQUIPMENT AND SUPPLIES
14. READ AND INTERPRET BLUEPRINTS AND SKETCHES
15. DRAW SKETCHES FOR SHOP OR FIELD PROJECTS

Appendix F

Sample: Comptency Based

Instructional System Developmental

Assessment Form

COMPETENCY BASED INSTRUCTIONAL SYSTEM
(DEVELOPMENTAL ASSESSMENT)

SCHOOL _____ PROGRAM AREA _____ INSTRUCTOR _____

(Address) _____ Current Enrollment _____ Length of time teaching _____

Person completing this form _____ Date _____

Directions for Use: Listed below, are characteristics of well structured competency based instructional materials; using the scale below, evaluate each characteristic as to its perceived degree of development.

1 = Non existent
2 = Evidence of some preliminary structure
3 = Basically developed (needs revised)
4 = Moderately developed (needs refined)
5 = Task completed

* CHARACTERISTICS - OF - STRUCTURE *	Item	Degree of Development (CIRCLE RESPONSE)
A. DEFINE SCOPE OF COURSE		
1. Description of the course offered under the assigned VEMIS title identifies occupations by D.O.T. titles and codes on which instruction is based.	A1	1 2 3 4 5
2. Occupations identified within the course are appropriate as evidenced by:		
a. occupational employment of recent course graduates over a three year period	A2a	1 2 3 4 5
b. 3-5 year projected occupational employment opportunities for current course students.	A2b	1 2 3 4 5
c. anticipated effect of advanced technology on occupational changes	A2c	1 2 3 4 5
d. documented approval from knowledge craft or advisory committee whose membership is representative of occupations	A2d	1 2 3 4 5
*		Total
B. VALIDATE OCCUPATIONAL COMPETENCIES		
1. Skills required in each identified occupation are readily distinguished.	B1	1 2 3 4 5
2. Task validation is evidenced by:		
a. sources for task identification	B2a	1 2 3 4 5
b. acknowledged changes within occupations	B2b	1 2 3 4 5
c. documented approval from knowledgeable craft or advisory committee	B2c	1 2 3 4 5
*		Total

	Item	Degree of Developm (Circle Response)
C. IDENTIFY VALID TERMINAL PERFORMANCE OBJECTIVE FOR EACH TASK		
1. Statement of performance objective for each task identifies:		
a. learner actions leading to terminal performance or end product	C1a	1 2 3 4 5
b. condition(s) under which task is performed	C1b	1 2 3 4 5
c. criteria to measure learner level of performance	C1c	1 2 3 4 5
2. Validation of terminal performance objective statement is evident by:		
a. identifying source of statement	C2a	1 2 3 4 5
b. documented approval from knowledgeable craft or advisory committee	C2b	1 2 3 4 5
*		Total
D. IDENTIFY SEQUENTIAL PERFORMANCE STEPS FOR EACH TASK		
1. Learning activities needed to complete a performance objective are identified for each task	D1	1 2 3 4 5
2. Learning activities identify:		
a. prerequisite skills (where necessary)	D2a	1 2 3 4 5
b. sequential arrangement of performance steps	D2b	1 2 3 4 5
3. Learning activity content and sequence validated through documented approval of knowledgeable craft or advisory committee.	C3	1 2 3 4 5
*		Total
E. DETERMINE RESOURCES REQUIRED TO PERFORM TASKS		
1. Task performance steps used to determine the following resources required for instruction and performance of learning activities:		
a. tools	E1a	1 2 3 4 5
b. equipment	E1b	1 2 3 4 5
c. materials	E1c	1 2 3 4 5
d. supplies	E1d	1 2 3 4 5
e. facility	E1e	1 2 3 4 5
f. safety	E1f	1 2 3 4 5
*		Total

	Item	Degree of Development (Circle Response)
F. DETERMINE REQUIRED TASK SEQUENCE		
1. Task sequencing pattern determined to facilitate instructional method	F1	1 2 3 4 5
2. Prerequisite tasks identified in task sequencing pattern, where applicable.	F2	1 2 3 4 5
*		Total
G. ASSESS STUDENT PERFORMANCE FOR EACH OBJECTIVE		
1. Evaluation instruments are designed to measure behavior in accordance with performance standards.	G1	1 2 3 4 5
2. A grading system converts performance evaluation to a conventional scale and contains provisions to inform students of evaluation prior to engaging in the learning experience.	G2	1 2 3 4 5
*		Total
H. IDENTIFY INSTRUCTIONAL PROGRAM CONTENTS FOR EACH STUDENT		
1. A documented career objective which contains specific competencies to be mastered is on file.	H1	1 2 3 4 5
2. Provisions are made to recognize and document prior student competence on required program skills.	H2	1 2 3 4 5
3. There is an IEP on file for each student which includes:		
a. total sequenced list of tasks	H3a	1 2 3 4 5
b. special services or conditions needed to learn or perform specific tasks	H3b	1 2 3 4 5
*		Total
I. DESIGN A LEARNING MANAGEMENT SYSTEM		
1. The procedure developed to monitor student task achievement includes system provisions for:		
a. recording verified student progress by task	I1a	1 2 3 4 5
b. student feedback	I1b	1 2 3 4 5
c. student access to task performance records	I1c	1 2 3 4 5
*		Total
J. CONDUCT COURSE EVALUATION		
1. Data is collected regularly to evaluate course effectiveness and provide basis for content revision from the following sources:		
a. student clinical performance	J1a	1 2 3 4 5

	Item	Degree of Development (Circle Response)
b. course materials evaluation	J1b	1 2 3 4 5
c. employer feedback on graduates	J1c	1 2 3 4 5
d. craft committee feedback on content validity	J1d	1 2 3 4 5
e. job placement by D.O.T. occupations	J1e	1 2 3 4 5
2. Course updating through use of evaluation data is documented.	2	1 2 3 4 5
*		Total

-SUMMARY-

Overall Course Development and Structure

Total possible for each section	Total - Each Section	Conversion Table Using Overall Total
A. - 25	A. _____	
B. - 20	B. _____	41 - 81 = Very limited development
C. - 25	C. _____	82 - 122 = Limited to moderate development and needs revised
D. - 20	D. _____	
E. - 30	E. _____	123 - 163 = Moderately to well developed but needs refined
F. - 10	F. _____	
G. - 10	G. _____	164 - 205 = Well structured with minimum of revision
H. - 20	H. _____	
I. - 15	I. _____	
J. - 30	J. _____	
Overall Total Possible - 205	*Overall Total -	

COMMENTS:

Appendix G

Lesson Plan Format Form

January, 1982

NORTH FAYETTE AVTS

Competency Based Instructional System

Lesson Plan Format
(Submit to Curriculum Coordinator)

Course Area_____ Instructor:_____

Date:_____

Directions: Please use this form when submitting all lesson plans (task packages) to the typist. Write as neat as possible and please print any technical terms that may be confusing. Also, present any diagrams as clearly as possible.

Course Division:

Task:

PERFORMANCE OBJECTIVE: (A precise statement explaining exactly what the student is expected to do.)

INFORMATION and/or REFERENCES: (Useful related information and/or resource material the student should review, if any)

MATERIALS and/or EQUIPMENT: (List the items and/or materials the student will need to complete the task.)

PERFORMANCE GUIDE: (The steps the student will follow to complete the task.)

SAFETY: (Safety related information which the student should be aware of)

CRITERION REFERENCE MEASURE: Another term for evaluating/grading. (State what criteria the student will be graded on and the level of acceptable performance)

Appendix H

Samples of Competency Based Instructional Modules

North Fayette Area Vocational–Technical School

COMPETENCY BASED INSTRUCTIONAL SYSTEM

Course Area: Safety	
Course Division: Fire Safety	Task: Understanding Principles of Fire Safety
Instructor:	

I. Performance Objective - Given related information about fire protection safety, fire fighting equipment and guidelines, the student will understand fire hazards and complete a fire protection test with 100% accuracy.

II. Information - The danger of fire is a concern in all aspects of your life. When working in the shop area, there are many fire hazards to be especially careful of such as electrical equipment, welding tools, fuel containers, and highly combustible materials. Always remember that fire can cause property damage, severe injury, and it can cause death. - Be Careful - Always.

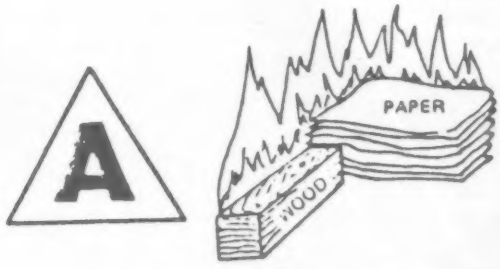
III. Material and/or Equipment - A. This Handout
B. Fire Protection Safety Test

IV. Performance Guide - (1) Read the information in the next section; when finished, (2) see the instructor for a copy of the fire safety test questions, and (3) return the test to the instructor.

1. Types of Fire Extinguishers

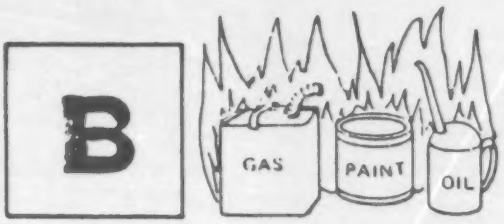
All fire extinguishers are divided into four types. The The classifications are based on the type of fire they extinguish. Some extinguishers carry two or more kinds of classification.

A. Type A extinguishers are used for combustible solids (things that burn), such as: paper, wood, cloth, etc.



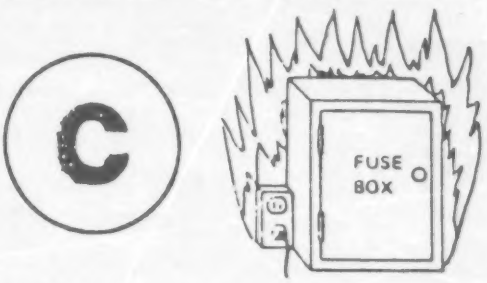
The symbol for type A extinguishers is a green triangle with the letter A in the center. This type of extinguisher is used on flammable solids.

B. Type B extinguishers are used on fires caused by liquids such as: gas, oil, paint thinner, etc.



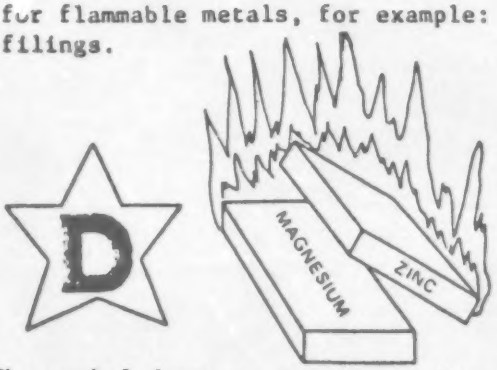
The symbol for type B extinguishers is a red square with the letter B in the center. This type of extinguisher is used on flammable liquids.

C. Type C extinguishers are used for electrical fires, for example: electric motors, fuse boxes, welding machines, etc.



The symbol for type C extinguishers is a blue circle with the letter C in the center. This type of extinguisher is used on electrical fires.

D. Type D extinguishers are for flammable metals, for example: magnesium, zinc, or iron filings.



The symbol for type D extinguishers is a yellow star with the letter D in the center. This type of extinguisher is used on flammable metals.

2. How to use fire extinguishers

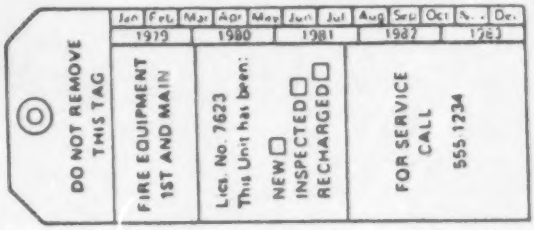
A. Read the operating instructions on the side of the extinguisher.

B. Know what ty pe of fire the extinguisher should be used for. Using the wrong type of extinguisher could be dangerous.

C. Point the extinguisher at the base of the fire ----

Point the extinguisher at the material burning, not at the flames themselves.

D. Check the tag on the extinguisher to see that it has been recently inspected ----



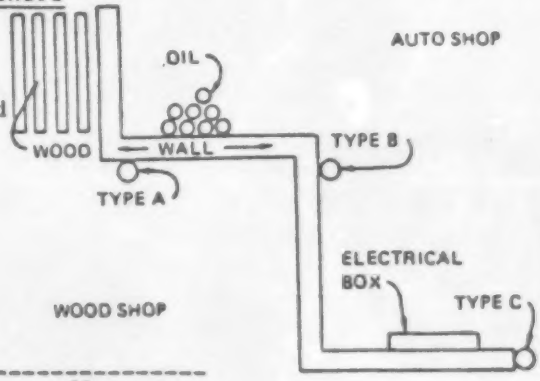
A tag like this should be on all fire extinguishers in the shop. Be sure the date marked on it has not passed.

E. If the seal is broken, have the extinguisher reinspected and recharged if necessary.

F. Know where all fire extinguishers are located.

3. Locating and marking fire extinguishers

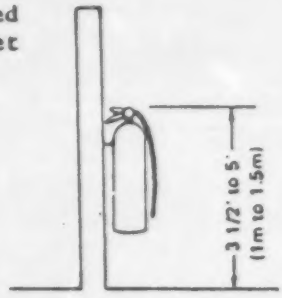
A. The type of extinguisher should cover the type of combustible materials found in the work area.



B. A fire extinguisher should be located just inside the door so that it can be reached easily.

C. Locate an extinguisher near flammable materials, but not so close that it cannot be reached in a fire.

D. The extinguisher should be mounted so the top is 3 1/2 feet to 5 feet from the floor.

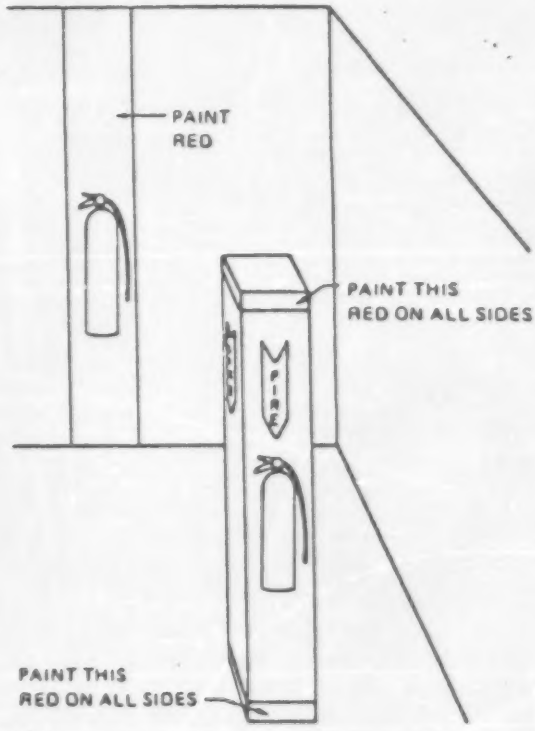


The fire extinguisher should be mounted at the correct height so it can be lifted off easily.

E. Mark the location of a fire extinguisher so that it can easily be seen from a distance.

Make the marking on a post or column so it can be seen from all areas.

Mark near the floor so the extinguisher can be located in a smoke filled room.



The markings that show locations of fire extinguishers should be large and easily seen.

---

4. Using welding tools near flammable materials

It is not always possible to remove flammable materials from the work area. If they cannot be removed, a person should stand fire watch.

A. A fire watch is needed if combustible materials are within 35 feet (10.7 m) of any welding or cutting.

B. A fire watch is needed if sparks can reach combustible materials further than 35 feet (10.7) away.

C. A fire watch is needed on lower levels if sparks can fall through holes in the floor and reach combustible materials on other floors.

D. The person standing fire watch must know how to sound the alarm.

E. The person standing fire watch must be instructed in the use of the available fire extinguisher.

F. Combustible materials that cannot be removed should be covered with wet sand or other fire resistant material before welding.

G. Advise a supervisor or instructor and get permission before welding near combustible materials that cannot be removed.

* End of required reading - if you feel ready, see the instructor to take the written safety test. *

V. Criterion Reference Measure:

Read the material on fire protection safety and answer the questions on the written safety test.

North Fayette Area Vocational–Technical School

COMPETENCY BASED INSTRUCTIONAL SYSTEM

Course Area: Safety	
Course Division: Fire Safety	Task: Fire Safety Test
Instructor:	

Performance Objective - After reading the information packet to develop fire protection safety habits, the student will answer the test questions with 100% accuracy.

Name _____ Date _____

Directions: Read each question and indicate the number of the rule in the information packet which most accurately answers the question.

1. How far from the floor should the top of a fire extinguisher be mounted?
2. Where should you point a fire extinguisher when putting out a fire?
3. A fire watch is needed if combustible materials are within how many feet of any welding or cutting?
4. What should you do if the seal is broken on a fire extinguisher?
5. What determines the type of extinguisher to be used.

Read each question and indicate the letter next to the statement that most accurately answers the question.

1. Why should a locating mark for a fire extinguisher be near the floor?
   a. so it can be seen easily when standing close
   b. so it can be seen in a smoke-filled room
   c. because the top may be covered by equipment
   d. all of the above

2. Which type of fire extinguisher would be needed in an area used for storing paint and paint thinner?
   a. type A
   b. type B
   c. type C
   d. type D

3. Which of the following should the fire watch know?

   a. how to sound the alarm

   b. how to use the fire extinguisher

   c. where to find the supervisor or instructor

   d. both a & b

4. When starting work in a new area, you should check which of the following about the fire extinguishers?

   a. their locations

   b. their inspection dates

   c. their operating instructions

   d. all of the above

5. What precaution is needed if sparks may fall down an elevator shaft on combustible materials below?

   a. wet sand to throw down in case of a fire below

   b. a fire hose

   c. a fire watch on each floor below

   d. none of the above

North Fayette Area Vocational–Technical School

COMPETENCY BASED INSTRUCTIONAL SYSTEM

Course Area: Automotive Feeder	
Course Division: Automotive Brake System	Task: Developing a Vocabulary of the Auto Brake System
Instructor:	

INSTRUCTIONAL OBJECTIVE:

Given a list of 25 words associated with the brake system, access to the Automotive Encyclopedia, you will write the definition of each word pertaining only to the automotive brake system.

RESOURCE AND LEARNING ACTIVITIES:

Read: Automotive Mechanics by Crouse, Chapter 56, pp 547-562

Read: Automotive Encyclopedia by Goodheart-Willcox, "Automotive Brakes" (read applicable passage) pp 507-538

Read: Auto Service and Repair by Stockel, "Brake Service" Chaper 29, pp 1-38

View: Evolution of Brakes by Ford (Filmstrip)

Define the following words, all definitions will be confined to the brake system.

1. Anti-Skid Device
2. Brake
3. Brake Fluid
4. Brake Lining
5. Brake Shoe
6. Caliper
7. Coefficient of Friction
8. Combination Valve
9. Disc Brake
10. Drum Brake
11. Dual-Brake System

12. Floating

13. Hydraulics

14. Kinetic Friction

15. Master Cylinder

16. Metering Valve

17. Parking Brake

18. Power Brake

19. Pressure Differential Valve

20. Proportioning Valve

21. Self Adjusting Brakes

22. Static Friction

23. Vacuum Booster

24. Wear Indicator

25. Wheel Cylinder

EVALUATION:

To complete this competency, all 25 words will be clearly defined with definitions pertaining only to the brake system. All spelling will be correct and answers will be limited to one short complete statement.

Instructor's Signature_____ Date Completed_____

INSTRUCTIONAL OBJECTIVE:

Given a Hydraulic Dual Brake System Simulator, you will identify all components in the brake system and explain their function in one short complete sentence.

RESOURCE AND LEARNING ACTIVITIES:

View: Transparency No. T-17 "Brake Assembly" by DCA Educational Products, Inc.

View: Transparency No. T-18 "Master Cylinder Assembly" by DCA Educational Products, Inc.

Read: Auto Service and Repair, by Stockel, "Brake Service", Chapter 29, pp 1-38

Read: Automotive Encyclopedia, by Toboldt-Johnson, "Automotive Brakes" pp 507-542 (applicable to vehicle)

Report to shop and perform the following:

1. Select safety glasses from cabinet and protect eyes before entering the shop area.

2. Identify the following brake components and explain their function.

   a) Anchors

   b) Backing Plate

   c) Bleeder Screw

   d) Brake Disc

   e) Brake Drum

   f) Caliper

   g) Hand Brake Cable

h) Master Cylinder

i) Power Booster (if applicable)

j) Primary Shoe

k) Retracting Spring

l) Secondary Shoe

m) Wheel Cylinder

EVALUATION:

To complete this competency, safety glasses will be worn while working in the shop area. All brake components will be correctly identified and the function of each will be given on paper in space provided. Complete brake system will be observed for any part not listed on your competency. This task will be performed within one class period.

Instructor's Signature_____ Completion Date_____

INSTRUCTIONAL OBJECTIVE:

Given a Rear Axle Assembly, access to safety glasses, and special brake tools, you will remove old shoes, inspect all brake parts for nicks, cracks, ditortion and discoloration due to excessive heat. Re-install with no binding or dragging of the brake drums.

RESOURCE AND LEARNING ACTIVITIES:

Read: Drum Brake Service Manual, by Delco, Section VI

View: Transparency T-17, "Brake Assembly" by DCA

Read: Auto Service and Repair, by Stockel, "Removing the Shoes" Chapter 29,p-15

Report to shop and perform the following:

1. Select safety glasses from cabinet and protect eyes before entering shop area.
2. Remove wheel and hub assemblies from both sides.
3. Remove brake springs with special brake spring pliers.
4. Remove brake shoe hold down springs or clips.
5. Remove brake shoes, adjustment screws and levers and place on work bench for inspection.

   NOTE: Disconnect hand brake operating lever from rear brake shoes.

   NOTE: Inspect parts for distortion cracks, looseness and discoloration due to excessive heat.
6. Inspect wheel cylinders for fluid leaks.
7. Clean and inspect backing plate and all attaching parts.

8. Install brake shoes.

9. Install brake shoe return springs, retainers, adjusting screws and levers.

10. Install brake drum assemblies.

11. Replace tools, equipment and safety glasses to their proper place.

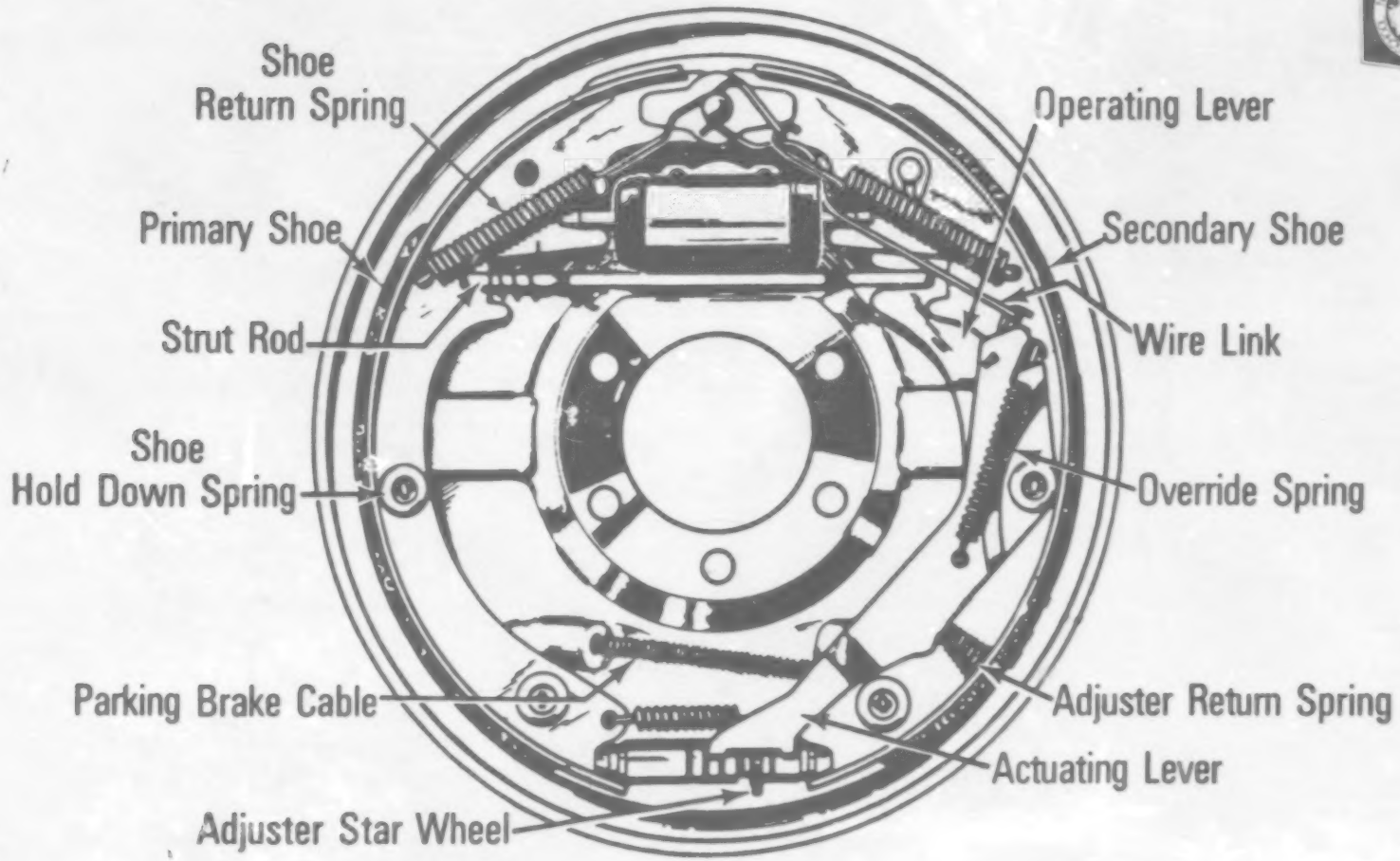
EVALUATION:

To complete this competency, safety glasses will be worn while working. Brake shoes will be installed and all metal to metal contact points will be lubricated with special brake lubricant. Shoes will have a slight contact with the drum but with no binding or dragging of the shoes.

This task will be completed within one class period.

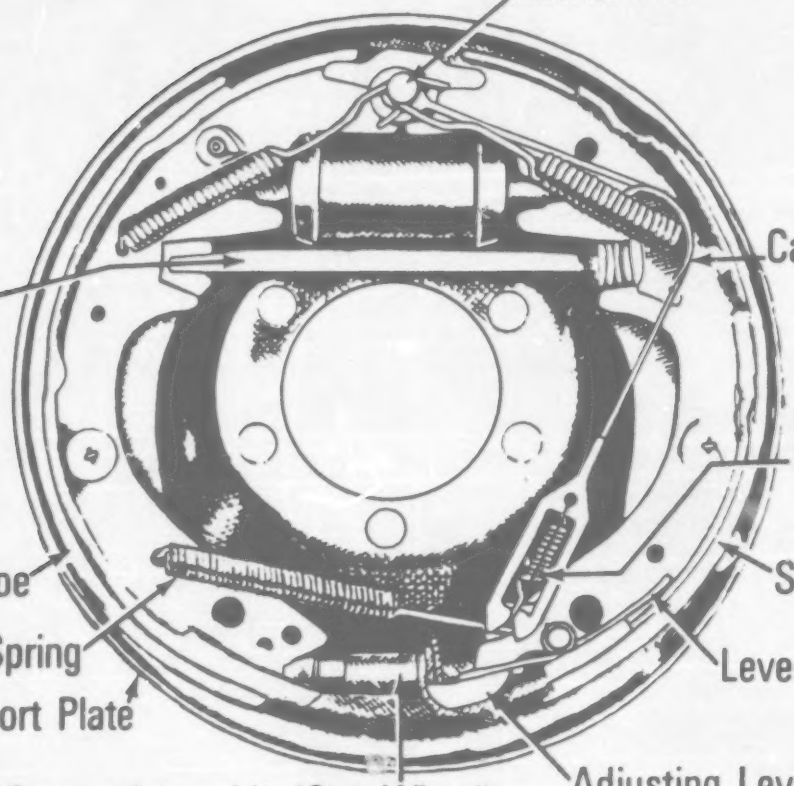
Instructor's Signature_____ Completion Date_____

Lever Type Self-Adjusting Brake System



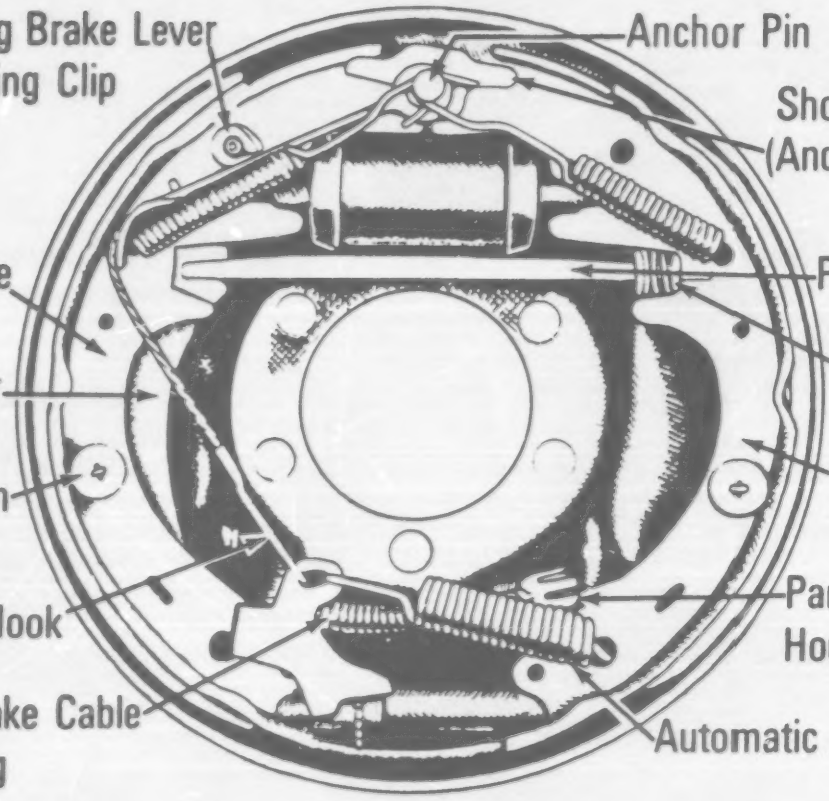
Cable Pull Self-Adjusting Brake System

(Late Type)



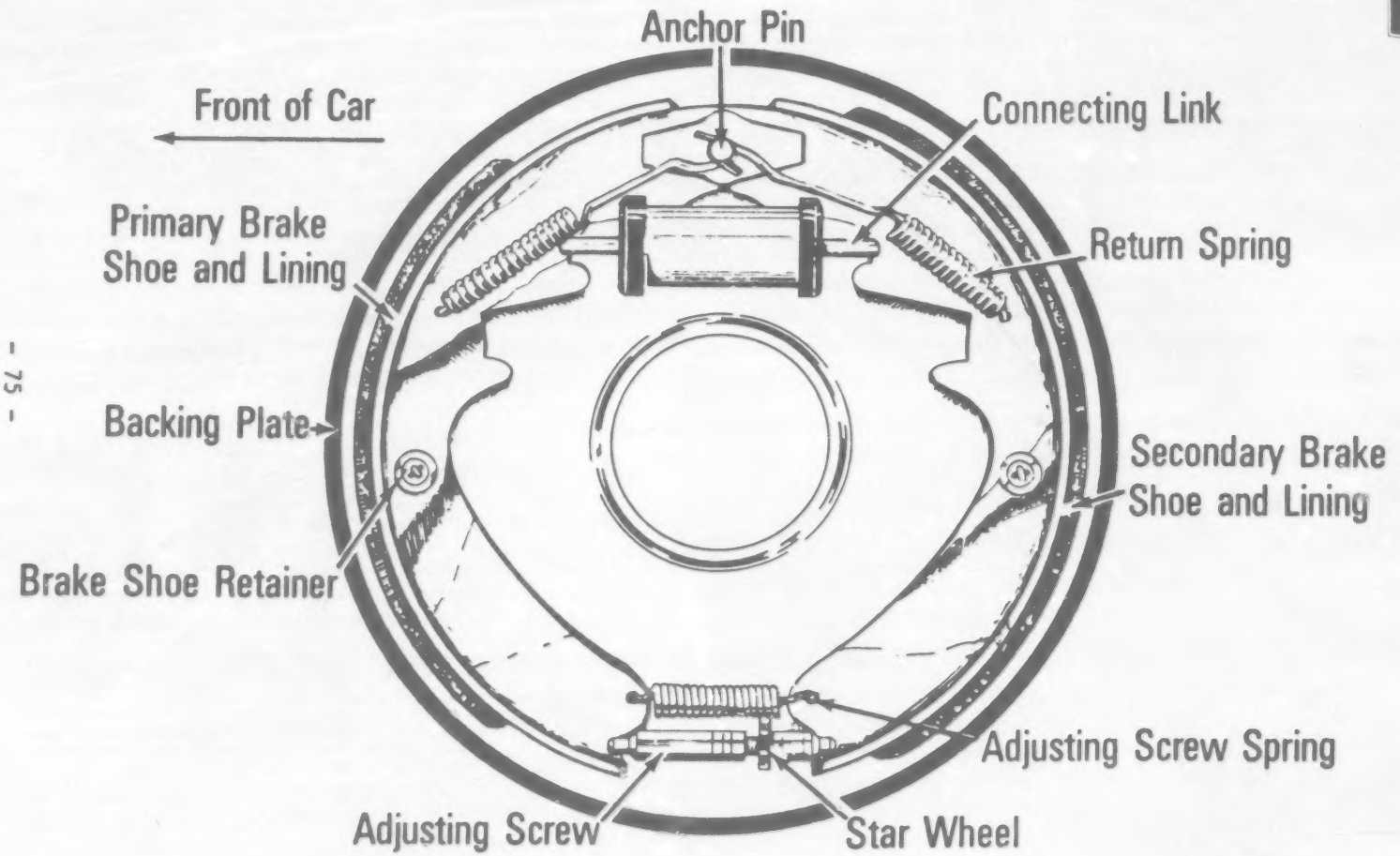
Cable Pull Self-Adjusting Brake System

(Early Type)



Rear Brake

Parts of the Standard Brake Assembly



INSTRUCTIONAL OBJECTIVE:

Given a vehicle with drum-type brakes to be adjusted, acces to safety glasses, brake adjusting tools and small hand tools, you will adjust brake shoe with brake adjusting tool by turning the star wheel and expanding the shoes outward againt the brake drum.

RESOURCE AND LEARNING ACTIVITIES:

View: Transparency No. T-17, "Brake Assembly" by DCA Educational Products, Inc.

Read: Auto Service and Repair, by Stockel, "Initial Adjustment-Self Adjusting Brakes, Chapter 29, p-21

Read: Motor Auto Repair Manual, by Motors, (applicable to vehicle)

Read: Manufacturer's Shop Manual, (for applicable vehicle)

Report to shop and perform the following:

1. Select safety glasses from cabinet and protect eyes before entering shop area.
2. Remove dust plug covers from brake adjusting access hole.
3. Insert small screwdriver in access hold and raise adjusting lever.

   NOTE: Consult manufacturer's manual for turning direction of star wheel.

   NOTE: Use special star wheel adjusting tool.
4. Adjust brake shoes until wheel will not rotate.
5. Back off star wheel adjuster until brake drum rotates freely.

   NOTE: Consult vehicle manufacturer's manual for final adjustment.
6. Return tools, equipment and safety glasses to their proper place.

EVALUATION:

To complete this competency, safety glasses will be worn while working in the shop area. Brake shoes will be adjusted to have a slight contact with the drum, but with no binding or dragging of the shoes.

This task will be completed within one class period.

INSTRUCTIONAL OBJECTIVE:

Given a wheel-cylinder to be serviced, access to an electric drill, small hand tools, brake cylinder hone, and brake fluid, you will remove, disassemble, inspect, hone and rebuild a wheel cylinder.

RESOURCE AND LEARNING ACTIVITIES:

Read: Auto Service and Repair, by Stockel, "Wheel Cylinder Repair" Chapter 29, pp 12-13.

Read: Motor Auto Repair Manual, by Motors, (applicable to vehicle)

Read: Drum Brake Service Manual, by Delco, Section 9 & 11

Report to shop and perform the following on the Valiant:

1. Select safety glasses and protect eyes before entering shop area.
2. Raise the vehicle and place a safety stand under the frame.
3. Remove wheel-brake cylinder from backing plate.
4. Disassemble wheel cylinder.
5. Wash the cylinder with alcohol and inspect inner surface for pitts scratches or wear.

   NOTE: Hone cylinder with fine wheel cylinder hone if necessary.
6. Check clearance between piston and cylinder wall using a Feeler Gauge.

   NOTE: Maximum clearance .005.
7. Lubricate all cylinder parts with brake fluid and install in cylinder.

   CAUTION: Make certain open side of wheel cylinder cups face inward.

8. Install cylinder on backing plate. Connect brake line, install shoes and drum.

9. Bleed the Brake System manually with help from another student.

10. Test brake pedal operation for firmness and pedal height.

11. Return all tools, equipment and safety glasses to their proper place.

EVALUATION:

To complete this competency, safety glasses will be worn while working with hydraulic brake fluid. Wheel cylinder will be removed from vehicle and disassembled, cleaned, inspected, honed and rebuilt with correct clearance (max. .005) between wheel cylinder and piston. Cylinder finish will be free of all score marks and pitting.

All cylinder parts will be lubricated with brake fluid before assembly. All air will be removed from the brake system and brake pedal will be solid (not spongy) and 1/2 distance from the floor.

This task will be performed within one class period with no damage to wheel cylinder parts or contaminate on the brake lining.

Instructor's Signature_____ Completion Date_____

INSTRUCTIONAL OBJECTIVE:

Given a Front Disc Brake Assembly, small tool kit, Caliper hone, Electric drill, and Dial Indicator, you will measure the run-out of the rotor, then service the Caliper.

RESOURCE AND LEARNING ACTIVITIES:

Read: Auto Service & Repair, by Stockel, Chapter 29, pp 29

Read: Single Piston Disc Brake Service Manual, by Delco, pp. 28-29

Report to the Shop and perform the following:

1. Select safety glasses from the cabinet and protect eyes.
2. Remove retaining bolts or pins.
3. Measure the Lateral run-out, using a Dial Indidator. Record your reading here_____.
4. Remove inner and outer brake pads.
5. Remove dust cover.
6. Remove piston from bore.
7. Inspect the bore for rust, corrosion, and pitting.
8. Remove the piston ring from the bore.
9. Hone the bore if necessary

10. Clean all parts with clean brake fluid.

11. Lubricate all parts with clean brake fluid.

12. Assemble the Caliper as outlined in the reference.

13. Replace all parts and tools to their proper places.

EVALUATION:

To complete this competency, safety glasses will be worn while working in the shop area. The Brake Caliper will be overhauled with no damage to the parts and the rotor will be measured for lateral run-out within .002" tolerance.

This task will be performed within one class period.

Instructor's Signature_____ Completion Date_____